conversion that both interpolates and generates YUV formats from a Bayer-pattern input. It is further desired to perform edge enhancement in an integrated manner with the conversion processing.

## Brief Description of Drawings

[0022] Figure 1 is a block diagram of a typical digital camera.

[0023] Figure 2 shows an image captured by a sensor that generates single-color pixels in a Bayer pattern.

[0024] Figure 3 highlights edge-enhancement during a direct conversion from RGB Bayer pattern to YUV.

[0025] Figure 4 shows a direct-conversion and edge-enhancement image processor using a 7-line Bayer-pattern buffer and 5-line and 3-line luminance buffers.

[0026] Figure 5 illustrates locations of the final generated Y, U, and V components for the five center rows of Bayer-pattern pixels stored in the 7-line buffer.

[0027] Figure 6A highlights preliminary luminance calculation from a Bayer-pattern input without intermediate RGB interpolation.

[0028] Figure 6B highlights edge enhancement of preliminary Y values.

[0029] Figures 7A-C illustrate chrominance calculation from Bayer-pattern input pixels and edge-enhanced luminance pixels without intermediate RGB interpolation.

[0030] Figures 8A-D illustrate patterns matched for preliminary luminance calculation and coefficients for generating preliminary YI luminance pixels without intermediate RGB interpolation.

[0031] Figures 9A-B show the pattern of the preliminary luminance Y values and the coefficients that are multiplied by the YI values to generate the edge-enhanced Y values.

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[0032] Figures 10A-E illustrate the pattern matched for chrominance calculation and coefficients for generating intermediate sums without RGB interpolation.

[0033] Figure 11A shows using an associative array processor to directly generate YUV pixels from an RGB Bayer-pattern without intermediate interpolation.

[0034] Figure 11B shows using a digital-signal processor (DSP) to perform luminance and chrominance calculations.

[0035] Figures 12A-E illustrate for an alternate Bayer pattern initializations the patterns matched for chrominance calculation and coefficients for generating intermediate sums without RGB interpolation.

## Detailed Description

[0036] The present invention relates to an improvement in digital image enhancement. The following description is presented to enable one of ordinary skill in the art to make and use the invention as provided in the context of a particular application and its requirements. Various modifications to the preferred embodiment will be apparent to those with skill in the art, and the general principles defined herein may be applied to other embodiments. Therefore, the present invention is not intended to be limited to the particular embodiments shown and described, but is to be accorded the widest scope consistent with the principles and novel features herein disclosed.

[0037] While edge enhancement could be performed on RGB pixels of the Bayer pattern or after YUV conversion is completed, the inventor has realized that edge enhancement can be included during a single re-formatting operation that converts RGB pixels to YUV pixels. Using such an integrated edge-enhancement and direct conversion step can reduce complexity and cost, as the intermediate full-pattern of interpolated RGB pixels are not generated.

[0038] RGB pixels are used to generate luminance Y values, which are then enhanced before the enhanced Y values are combined with the RGB values to generate the chrominance U, V values. Thus edge-enhancement of the Y values also enhances U, V chrominance values are they are being generated. All three components - Y, U, and V - benefit from edge enhancement, although edge enhancement is only directly performed on Y values.

[0039] Figure 3 highlights edge-enhancement during a direct conversion from RGB Bayer